GEOLOGY 307/L: Igneous and Metamorphic Petrology
Syllabus, Spring 2017

Lecture: TTh 11:00 a.m. – 12:15 p.m.
Lab: Th 2:00 p.m. – 4:45 p.m.
Instructor: Dr. Joshua Schwartz
Office: Live Oak Bldg., Room 1200
Office Hours: Tuesdays 1:00 p.m.-2:00 p.m., or by prior appointment
Email: joshua.schwartz@csun.edu

TEXTBOOK (REQUIRED):
Frost and Frost, Essentials of Igneous and Metamorphic Petrology (2013); supplementary lecture notes are available for reading and downloading on the Moodle website for this course.

Course objectives:
Introduction to the classification and origin of igneous and metamorphic rocks, including the optical properties of minerals. Lab study of these rocks utilizes hand-specimen characteristics and the petrographic microscope.

POLICIES
1. Office hours are listed above. If you cannot meet during office hours, please email me and we can set up a different time to meet.

2. Punctual attendance, participation, and mental engagement is essential for success in this class and in life. Please make every effort to show up to class on time.

3. Announcements and assignments will be discussed in class and posted on the Moodle website for this class. Please check it often.

4. Lectures will be posted on Moodle before class. However, as a word of caution, online lectures are not a substitute for coming to class.

5. No late work will be accepted or graded for feedback. I am extremely strict about this policy. An assignment is considered ‘late’ whether it is turned in one minute or one hour after a deadline.

6. No makeup exams will be given.

7. Cell phones may not be used at any time during class or lab. They are disrupting to me and to other students. In the case of an emergency, please leave the class to use your cell phone, otherwise I will confiscate any cell phones used during class time.
8. Laptops are a wonderful resource for taking notes. However, laptops are not to be used during class time to surf the web or play games. If I observe any students using their laptops in this manner, you will be asked to leave.

TIPS FOR SUCCESS IN PETROLOGY

This course is the capstone of your studies in mineralogy and petrology at CSUN and is intended to be a rigorous and in-depth study of magmatic and metamorphic systems. Consequently, this course involves a considerable amount of new material. It is advisable to examine each day's lecture notes and to insure that all material covered that day is understood prior to the next class meeting. If you are uncertain about any point discussed in our previous meeting, please be sure to ask for clarification. You will then find studying the course materials much easier. Attendance at lectures and laboratory is mandatory.

Here are some additional tips for your success:

- Read your syllabus and follow the policies outlined within it.
- Ask questions in class if you do not understand a concept.
- Be fully engaged in the material during class. You can minimize study time if you come to class and give it your full attention.
- Read ahead and write down your questions. You'll enjoy it and be more engaged in the class.
- Explore methods of how to take notes.
- Complete all assignments and turn them in on time.
- If you miss a lecture – read the material and get a copy of the notes from a classmate.
- If you don't do well on the first exam, come to office hours and ask for help right away.
- If you have questions or thoughts, come by during office hours; this is designated time for you to use.
- Check your final exam schedule for ALL your classes NOW for any conflicts.

As a rule of thumb, one unit of undergraduate course credit at CSUN will require 2 hours of outside study. This course is worth 3 credits; an average student (C grade) can expect to work at least 6 hours outside of class for this course per week. If you want to earn a B or an A in the course, then you should expect to work more hours than the minimum expectation. I expect that you will spend at least this amount of time outside of lecture reading the textbook before coming to class, doing the lecture homework, using the resources on Moodle and reviewing/studying key concepts.

EVALUATION DETAILS

GRADING (Lecture)

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homeworks/In-class exercise</td>
<td>30%</td>
</tr>
<tr>
<td>Online (Moodle) quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Mid-term test</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
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<tr>
<td>Final Project</td>
<td>10%</td>
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**GRADING (Laboratory)**

- Laboratory pre-test: 10%
- Laboratory reports: 75%
- Attendance: 15%

A+ 99-100%; A 92-98.9%; A- 90-91.9%; B+ 88-89.9%; B 82-87.9%; B- 80-81.9%;
C+ 78-79.9%; C 72-77.9%; C- 70-71.9%; D+ 68-69.9%; D 62-67.9%; D- 60-61.9%;
F 0-59.9%.

I do not give extra credit.

I do not give ‘Incompletes’ for grades. No exceptions.

**EXAMS**

This class will have 2 exams (midterm and final exam). You are required to take the exams as they are scheduled. I do not give make-up exams. Therefore, if you miss an exam, a grade of ‘0’ will be recorded. Be sure to check the exam schedule immediately so that you avoid missing any exams; buying a plane ticket home prior to the exam time, or failing to show up to the designated exam time are not valid excuses, and will result in you receiving a grade of ‘0’. If you miss an exam due to an extraordinary circumstance (such as a serious illness or a medical or family emergency), you must have official documentation available for me to verify those circumstances, and you must supply that documentation within 24 hours of the exam date.

**FINAL PROJECT:** Each student will complete a final project examining aspects of a petrologic process. I will give additional information throughout the semester. Possible project ideas will be discussed in class.

**MISSED CLASSES**

I expect that you will attend every class unless you are seriously ill. I keep track of attendance as a means of assessing your commitment to the course, and it counts towards your course grade. If you choose to drop the course, it is your responsibility to formally drop the class; I will not administratively drop you from the course. Under normal circumstances, you cannot drop the course after the second week. Only with proof of a serious and compelling reason (see Schedule of Classes) will a student be allowed to drop after the second week. If you decide to drop, please let me know so that a student on the waiting list may take your spot instead.

**ACADEMIC DISHONESTY**

Official California State University policy states: “The maintenance of academic integrity and quality education is the responsibility of each student within this university and the California State University system. Cheating or plagiarism in connection with an academic program at a campus is listed in Section 41301, Title 5, California Code of Regulations, as an offense for which a student may be expelled, suspended, or given a less severe disciplinary sanction. Academic dishonesty is an especially serious offense and diminishes the quality of scholarship and defrauds those who depend upon the integrity of the campus programs. Such dishonesty includes but is not limited to: cheating, fabrication, facilitating academic dishonesty, and plagiarism.”
I do not tolerate any form of academic dishonesty. I expect that you will uphold the integrity of the academic environment here at CSUN; however, if I find evidence of academic dishonesty, I will report such evidence to the Office of the Vice President for Student Affairs and recommend disciplinary action. If you are caught cheating in my class, you will be given a failing grade for the assignment and the course. This includes, but is not limited to: plagiarism, copying answers during an exam, facilitating cheating by another student, altering a test grading sheet after the exam, or lying about an excuse for missing the exam. Plagiarism includes the use of paragraphs or even long phrases and diagrams or parts of diagrams from peer or former student assignments.

PETROLOGY LABORATORY SCHEDULE: Please note Petrology Laboratory commences the week of January 30th.

Week  Topic
1 Tools of microscopy: Introduction to the petrographic microscope
2 Tools of microscopy: Introduction to the Scanning Electron Microscope
   Introduction to the SEM: [https://csun.voicethread.com/share/8066915/](https://csun.voicethread.com/share/8066915/)
   a) Virtual Lab—Introduction to the SEM and Imaging 1: [https://youtu.be/bJIUtM-uKJI](https://youtu.be/bJIUtM-uKJI)
   b) Virtual Lab—Introduction to the SEM and Imaging 2: [https://youtu.be/DUgg6keZt4M](https://youtu.be/DUgg6keZt4M)
   c) Virtual Lab—Introduction to the SEM and Imaging 3: [https://youtu.be/oz6jrQVhpLg](https://youtu.be/oz6jrQVhpLg)
3 Mid-ocean ridge gabbro and basalt thin sections
4 Mid-ocean ridge gabbro and basalt thin sections 2
5 Serpentinite, blueschist and eclogitic metamorphism
6 Serpentinite, blueschist and eclogitic metamorphism 2
7 Identifying and quantifying volcanic groundmass with SEM-BSE images (ImageJ)
8 Spring Break!!!
9 Sierra Nevada batholith and Peninsular Ranges batholith
10 Calculating mineral formulae from SEM-EDS data
   a) Introduction to the South Mountain Core Complex: [https://csun.voicethread.com/share/8067010/](https://csun.voicethread.com/share/8067010/)
   b) Virtual Lab—South Mountain SEM-EDS maps: [https://youtu.be/4iADRL7Twck](https://youtu.be/4iADRL7Twck)
   c) Virtual Lab—South Mountain SEM-EDS maps: [https://youtu.be/KlJv2-s6_4w](https://youtu.be/KlJv2-s6_4w)
11 Zealandia extensional fault exercise: Quantifying Shape Preferred Orientation in deformed rocks with ImageJ
   a) Introduction to Zealandia: [https://csun.voicethread.com/share/8067029/](https://csun.voicethread.com/share/8067029/)
   b) Virtual Lab—Shape and Lattice Preferred Orientations: [https://youtu.be/jAf6b2gzba](https://youtu.be/jAf6b2gzba)
12 Regional metamorphism, UHP-metamorphism, S-type magmas
13 Hawaiian volcanic rocks
14 Final Project Preparation
15 Final Project Presentations
FIELD TRIPS: Two trips have been organized to illustrate various field relations of igneous and metamorphic rocks. Trip will last 1 and 3 days, and arrangements should be made for Friday classes missed (a request for leave to your instructors will be provided on request). Attendance is mandatory. Students who miss a field trip will be assigned a term paper. The following are tentative field trip dates to be finalized within the week:

3/4 San Gabriel Mountains day trip.
4/6-9 Peninsular Ranges batholith weekend field trip

SCHEDULE
The relevant reading assignments are listed next to the lecture dates throughout the semester; the reading is to be done BEFORE coming to class.

TENTATIVE PETROLOGY LECTURE SCHEDULE:

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture Topic</th>
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<tbody>
<tr>
<td>1-23/25</td>
<td>Introduction and take home pre-test—due Monday 1/30</td>
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<tr>
<td>1-30/2-1</td>
<td>Introduction to Igneous Petrology and Phase Diagrams (Chapters 1 &amp; 2)</td>
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<tr>
<td>2-6/8</td>
<td>Phase Diagrams (Chapters 2)</td>
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<td>2-13/15</td>
<td>Silicate Melts and Chemistry of Igneous Rocks (Chapters 3 and 4)</td>
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<tr>
<td>2-20/22</td>
<td>Chemistry of Igneous Rocks (Chapter 4)</td>
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<tr>
<td>2-27/3-1</td>
<td>Basalts and Mantle Structure (Chapter 5)</td>
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<tr>
<td>3-6/8</td>
<td>Oceanic Magmatism (Chapters 6)</td>
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<tr>
<td>3-13/15</td>
<td>Convergent Margin Magmatism (Chapters 7)</td>
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<td><strong>Mid-term Test (3/15)</strong></td>
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<tr>
<td>3-20/22</td>
<td>Spring Break!!</td>
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<tr>
<td>3-27/29</td>
<td>Interpretation of Granitic Rocks</td>
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<tr>
<td>4-3/4-5</td>
<td>Introduction to Metamorphic Petrology (Chapter 11)</td>
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<tr>
<td>4-10/12</td>
<td>Introduction to Metamorphic Phase Diagrams (Chapter 12)</td>
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<tr>
<td>4-17/19</td>
<td>Metamorphic Facies and Metamorphism of Mafic Rocks (Chapter 13)</td>
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<td>4-24/26</td>
<td>Thermobarometry and Conditions of Metamorphism (Chapter 14)</td>
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<tr>
<td>5-1/3</td>
<td>Regional Occurrence and Tectonic Significance Metamorphic Rocks (Chapter 18)</td>
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<tr>
<td>5-8/10</td>
<td>Project presentations</td>
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May 16 10:15-12:15 p.m. **FINAL EXAM (Cumulative)**